

## **APPENDIX G**

### **IMPACT AREA GROUNDWATER STUDY OFFICE, FINAL SAMPLING PLAN FOR UXO DETONATION**

**Engineering Evaluation and Cost Analysis (EE/CA)  
Camp Edwards Former H Range (Camp Goodnews)  
Sandwich, Massachusetts  
March 6, 2002**

**THIS PAGE INTENTIONALLY LEFT BLANK**

# **IMPACT AREA GROUNDWATER STUDY OFFICE**

Building 2816, Room 228, Camp Edwards, MA 02542-5008 / TEL 508-968-5821

---

**TO:** Mr. Todd Borci – USEPA-1

Ms. Jan Drake – MADEP SERO

**cc:** MAJ Joe Knott – NOB  
Mr. Shaun Cody – MAARNG  
Mr. Marc Grant – Ogden

**FROM:** Ben Gregson – Project Officer – Impact Area Groundwater Study

**DATE:** October 18, 1999

**SUBJECT:** Final Sampling Plan for UXO Detonation

---

## **Introduction**

The following sampling plan has been prepared by the Massachusetts Army National Guard (MAARNG) Impact Area Groundwater Study Office and the National Guard Bureau (NGB) in support of future open detonation of unexploded ordnance (UXO) at the Massachusetts Military Reservation (MMR). The goal of the sampling is to assess potential environmental impacts from detonation of individual UXO and, if necessary, to establish a baseline for additional investigation and response actions. This final version is based on the July 29, 1999 Sampling Plan and Addendum #1 dated October 1, 1999. In addition, the plan has been revised to remove some of the references to the original nineteen UXO items in order to make the plan applicable for future open detonations.

## **Background**

As of July 26, 1999, a total of nineteen UXO items were identified as part of the Impact Area Groundwater Study. Because of their location, several of the UXO were preventing progress of the Groundwater Study. In addition, the presence of these UXO presented a safety risk to users of the MMR. Under an agreement with the Environmental Protection Agency (EPA-1) these UXO were inspected by a team of explosive ordnance experts from the Department of Defense during the week of July 19, 1999. The purpose of the inspection was to positively identify the UXO and to establish if these items could be safely transported or rendered safe, or, alternatively, if they needed to be blown in place.

There is concern regarding potential environmental impacts which may result from the detonation of the UXO. In order to assess these potential impacts, the Massachusetts Army National Guard (MAARNG) Impact Area Groundwater Study Office has developed the following sampling plan. This plan is based on similar sampling plans prepared in cooperation with the Massachusetts Department of Environmental Protection (MADEP) under an Immediate Response Action (IRA) completed in 1998 (Release Tracking Number 4-13683). This 1998 IRA included the sampling of soil within the crater resulting from the detonation of two 105 mm artillery rounds.

## **Sampling Objectives**

Under the Impact Area Groundwater Study, explosive compounds have been reported in groundwater and soil samples collected from the Impact Area and training ranges. Open detonation of explosives is a possible source of the compounds reported in the study. Given these considerations, there is a concern that the open detonation of UXO may result in contamination of the underlying soil. The objective of this sampling plan is to sample the surface soil within the crater immediately after detonation in order to measure the levels of any explosives remaining in the soil. It is important to note that for safety reasons, the sampling plan does not include collection of samples prior to detonation of the UXO.

If explosive residue is present after detonation, the surface soil in the blast crater would be expected to represent the highest, “worst-case” concentrations. Based on the results of the soil analysis, additional sampling and remediation will be implemented, if necessary,

## **Soil Sampling and Analysis**

Immediately after open detonation, the EOD or UXO contractor will inspect the area for explosives and fragments. The EOD/UXO contractor will collect and properly dispose of any undetonated explosive material identified during the reconnaissance. The location(s) of the undetonated explosives will be flagged and photographed for soil sampling.

In general, soil sampling will be conducted in accordance with procedures established under the Impact Area Groundwater Study. Soil sampling of the blast craters will be conducted within 72 hours of detonation (or sooner if rain is predicted). A five point sampling grid will be established within each blast crater. The grid points will be at the northwest corner, northeast corner, center, southwest corner and southeast corner. Grab soil samples will be collected at each grid point from the surface to a depth of approximately three inches using a disposable scoop. The five grab samples will be combined to form a single composite sample for each blast crater. In addition, a single grab sample will be collected from the center of the blast crater and from beneath any undetonated explosive fragments identified.

In circumstances where: 1) the round is detonated with a shaped charge, and: 2) the round is determined not to be high explosive after the demolition operation is conducted and a distinguishable crater is not formed; then, a single grab soil sample will be collected from beneath the round.

The samples will be assigned a unique identification designation based on the UXO type and location. Samples will be delivered under chain-of-custody protocols to a certified laboratory (Severn Trent) for analysis. Based on discussions with EPA on July 22, 1999, the single grab sample collected from the center of the blast crater (and from inert rounds opened with shaped charges) will be analyzed for explosives, volatile organic compounds, semi-volatile organic compounds and metals in accordance with Impact Area Groundwater Study standard methods. Grab samples from beneath the undetonated explosive material and the composite samples will be analyzed for explosives only.

## **Air Monitoring Requirements**

Given the limited nature and location of the open detonations, detectable air impacts are not expected. The MADEP did not require air monitoring for the detonation of the two 105 rounds in 1998. Additionally, EPA has not required air monitoring for previous detonations of single UXO. From a practical standpoint, it is unlikely that monitoring devices could be placed close enough to the detonation to capture detectable levels of explosive compounds. It is even more unlikely that detectable levels of explosives could be measured at the MMR boundary.

The MAARNG purposes to conduct limited air monitoring in order to document ambient air conditions during the open detonations, Air monitoring will be conducted during the open detonations to assess the potential for off-site migration of explosive compounds through the air pathway. Samples will be collected at the closest accessible downwind location that is determined to be safe by MAARNG. A high-volume sampler equipped with a filter to collect particulates and a trap to vapor-phase constituents of the air will be used. Since the time period of potential impact from the detonation will be short, it is anticipated that the sampling duration will be limited to approximately one hour starting at the time of detonation, unless field observations warrant longer sampling times. The samples will be submitted to Severn Trent for extraction and analysis by Method 8330 for the same list of explosives as for the soils. MAARNG will review the results of these analyses with EPA and MADEP to assess the need for air monitoring during this activity on an ongoing basis. The air monitoring plan may be modified based on the results of the initial monitoring.

### **Reporting**

The MAARNG/IAGWS Office will prepare a technical memorandum describing the results of the soil sampling. The memo will include a tabulation of the explosive results if these compounds are identified at concentrations above the detection limits. Sketch maps of the sampling locations and complete laboratory analytical reports will be included as attachments to the memo.

### **Schedule**

The EPA will be notified of any planned open detonation within a minimum of 72 hours. The public will be notified a minimum of 48 hours prior to the planned detonations. Soil samples will be collected by within 72 hours of the open detonation event. The MAARNG will provide copies of the non-validated / PDA-confirmed results to the EPA and MADEP within 24 hours of receipt. The MAARNG will submit a draft technical memorandum to the EPA and DEP within 30 days of receipt of complete validated sampling results from all of the blast craters sampled. MAARNG will prepare a final technical memorandum for distribution to the IART within 10 days of receipt of written comments from EPA and MADEP.

### **Supplemental Response Action**

If explosive compounds are reported at concentrations above the detection limits of the analysis, the MAARNG may propose supplemental response actions to further assess the extent of contamination and the need for soil remediation. The MAARNG will review the results with the EPA and MADEP and, based on the concentrations reported, may develop a supplemental sampling plan to include expanded grids and/or deeper sampling depths. Once the extent of impacted soil is established, the need for further response actions will be evaluated in cooperation with EPA and MADEP.

Site-specific, risk-based soil clean up standards have not been established for the MMR. For the near-term, MAARNG proposes to use the MADEP Massachusetts Contingency Plan (MCP) Method 1 S-1/GW-1 Soil Standards, if available, or the MCP S1 Reportable Concentrations (RCS1) to evaluate the need for further sampling and/or remediation. Table 2 provides a listing of the applicable MCP Method 1 S-1/GW-1 cleanup standards and RCS1 Reportable Concentrations.

**Table 2 – MCP Method 1 Standards and RCS1 Reportable Concentrations**

<b>Method 8330 Compound</b>	<b>MCP Method 1 S-1/GW1 Cleanup Standard (mg/KG)</b>	<b>RCS1 Reportable Concentration (mg/KG)</b>
1,3,5-TRINITROBENZENE	NS	50
1,3-DINITROBENZENE	NS	100
2,4,6-TRINITROTOLUENE	NS	100
2,4-DIAMINO-6-NITROTOLUENE	NS	NS
2,4-DINITROTOLUENE	0.7	0.7
2,6-DIAMINO-4-NITROTOLUENE	NS	NS
2,6-DINITROTOLUENE	NS	50
2-AMINO-4,6-DINITROTOLUENE	NS	NS
2-NITROTOLUENE	NS	500
3-NITROTOLUENE	NS	500
4-AMINO-2,6-DINITROTOLUENE	NS	NS
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZ...	NS	100
NITROBENZENE	NS	500
OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7...	NS	NS
PENTAERYTHRITOL TETRANIT...	NS	NS
PICRIC ACID	NS	100
TETRYL	NS	100
NITROGLYCERIN	NS	50

NS = No Standard

The Massachusetts Contingency Plan Method 1 S-1/GW-1 cleanup standards are conservative standards that take into consideration direct contact and leaching to groundwater used as a drinking water source. Unfortunately, standards have only been developed for one compound on the Method 8330 target analyte list. As an alternative, the MAARNG will compare explosives concentrations in soil to the MCP S1 Reportable Concentrations (RCS1). These standards establish the threshold concentration above which notification to the MADEP of a release of hazardous materials is required. The RCS1 Reportable Concentrations are applicable for soil existing above a drinking water resource and take into account direct contact with impacted soil. These are not clean-up standards; however, they do establish an important regulatory threshold and they provide a frame of reference for compounds which may be detected during the soil sampling.

The MAARNG will review the sampling results with the EPA and MADEP to establish a scope of work and goals for any remediation required as a result of the open detonation activities. The proposed remedial approach will consider EPA's desire to achieve levels below the detection limits of the analysis, published standards and MADEP's requirements under the MCP to remediate to levels that achieve or approach background.